

Far North PWA

Great Artesian Basin (J-K) aquifer

2016 Groundwater level and salinity status report



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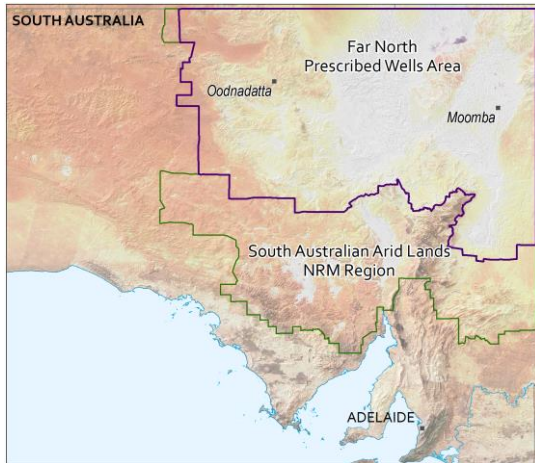
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Regional Setting



The Far North Prescribed Wells Area (PWA) is located in the South Australian Arid Lands Natural Resources Management Region and is bounded in the north and east by the state's shared borders with New South Wales, Queensland and the Northern Territory. The Far North PWA covers approximately 315,000 km² (~32% of the state) and is prescribed under South Australia's *Natural Resources Management Act 2004*. A water allocation plan (WAP) provides for the sustainable use of the groundwater resources.

Groundwater in the Far North PWA is sourced predominately from the Cadna-owie Formation and Algebuckina Sandstone (and equivalents), which as a single aquifer unit is described as the Jurassic-Cretaceous (J-K) aquifer, and represents the Great Artesian Basin (GAB) at a regional scale—herein referred to as the GAB (J-K) aquifer which is the focus of this report. The depth to the GAB (J-K) aquifer is as much as 2400 m below ground level in the state's north-east, but this decreases towards the edge of the basin, with the aquifer cropping out along the western and southern margins. The GAB (J-K) aquifer ranges from less than 50 m in thickness around the basin's western margin to greater than 500 m near the Poolowanna Trough (Fig. 1).

Recent research has shown that much of the groundwater contained in GAB (J-K) sediments in South Australia was recharged more than 10,000 years ago under different climatic conditions to those that are observed today. Present-day recharge along the western margin of the GAB in South Australia is low and although active recharge occurs to the GAB from the flooding of ephemeral rivers in Northern Territory, the rates of recharge are relatively low compared to rates of discharge. Upward leakage from the underlying Cooper Basin is also thought to contribute recharge to the GAB aquifer, but the size of this flux is yet to be determined.

2016 Status

The GAB (J-K) aquifer in the Far North PWA has been assigned a green status for 2016:

2016 Status



Positive trends have been observed over the past five years

The 2016 status for the GAB (J-K) aquifer is based on:

- most monitoring wells (55%) showing a five-year trend of rising or stable groundwater pressure levels
- all monitoring wells showing a five-year trend of stable groundwater salinities.

Although a green status has been assigned to the GAB (J-K) aquifer, steady declines in groundwater pressure levels, shown by BHP Billiton's Olympic Dam (Wellfield B) monitoring network, are acknowledged.

It is also acknowledged that a number of wells, located mainly in the Western Recharge Zone, Western Zone and Central Zone of the PWA, and not included in the report because of paucity of recent water pressures measurements (last three years), are showing a steady long-term trend of decline in water pressure levels.

Also, the assigned status for the J-K aquifer cannot be generalised across the entire Great Artesian Basin groundwater system as the majority of monitoring wells are concentrated in the south-western part of the PWA, and these wells monitor mainly the J-K aquifer.

Rainfall

As local rainfall has no influence on pressure levels or rates of groundwater extraction from the GAB, rainfall analysis is not presented in this report.

Water use

The WAP for the Far North PWA estimates groundwater extraction from the GAB (J-K) aquifer to be in the order of 90 ML/d for stock and domestic use and 4 ML/d for town water supply purposes. Recent water-use savings have been achieved via the Great Artesian Basin Sustainability Initiative that has included replacing bore drains with piping and rehabilitating free-flowing wells. Across the total areal extent of the GAB, these measures have resulted in an estimated saving of 545 ML/d (199 000 ML/y)¹. Estimated total groundwater discharge from naturally-occurring springs is around 66 ML/d, but this has not yet been validated because of the difficulties in measuring actual flows. Petroleum operations have a current allocation volume of 60 ML/d for water that is co-produced during the extraction of oil and gas. Current mining operations have a total allocation volume of 44.6 ML/d of which 42 ML/d have been granted to BHP Billiton's Olympic Dam mine as special water licence to extract water from the GAB (J-K) aquifer under the *Roxby Downs (Indenture Ratification) Act 1982*. While the mine itself is located outside of the Far North PWA, the wellfields are located within the PWA.

Groundwater levels

From a total of 29 monitoring wells, 14 wells (48%) show a trend of rising groundwater pressure levels in the five years to 2016, while two wells (7%) show stable pressure levels. Rises in pressure levels ranged between 0.02 and 1.26 m/y, with a median of 0.20 m/y. These wells are mostly located around the Oodnadatta region (Fig. 1). The remaining thirteen monitoring wells (45%) show a trend of declining groundwater pressure levels and these wells are mainly located in the western half of the South West Springs Groundwater Management Zone, near William Creek and in the Central Zone. Decline in pressure levels ranged between 0.03 and 1.15 m/y, with a median of 0.10 m/y (Fig. 1). Of these wells, 21% show their lowest pressure level on record.

¹ Additional information related to the Great Artesian Basin Sustainability Initiative (GABSI) can be found online at <http://www.agriculture.gov.au/water/national/great-artesian-basin/great-artesian-basin-sustainability-initiative> or <https://www.dnrm.qld.gov.au/water/catchments-planning/catchments/great-artesian-basin/gabsi>

In addition, data extracted from the BHP Billiton's Olympic Dam mine monitoring network (i.e. the Wellfield B extraction area) show a declining trend in groundwater pressure levels.²

Groundwater salinity

In 2016, salinities from 47 monitoring wells ranged between 350 and 5500 mg/L, with 30% of these wells showing a salinity of less than 1500 mg/L and 47% between 1500 and 3000 mg/L (Fig. 2). Good-quality groundwater (<1000 mg/L) is typically found within the Central Groundwater Management Zone.

In the five years to 2016, all (DEWNR obswells) monitoring wells show either a trend of decreasing or stable salinity (Fig. 3); furthermore, data extracted from the Heathgate Resources mine monitoring network south-east of Arkaroola, show a five-year trend (2012–16) of stable groundwater salinities³.

² BHP Billiton's Olympic Dam mine monitoring network data is not yet available via DEWNR's Enviro Data SA website, but can be found online at http://minerals.statedevelopment.sa.gov.au/mining/mines_and_quarries/olympic_dam

³ Heathgate Resources mine monitoring network data is not yet available via DEWNR's Enviro Data SA website, but can be found online at http://minerals.statedevelopment.sa.gov.au/mining/mines_and_quarries/beverley_and_beverley_north_mines.

More information

To determine the status of the GAB (J-K) aquifer for 2016, the trends in groundwater pressure levels and salinities over the past five years (2012 to 2016, inclusive) were analysed, in contrast to the year-to-year assessments that have been used in past *Groundwater level and salinity status reports*. Please visit the [Frequently Asked Questions](#) on the *Water Resource Assessments* page on WaterConnect for more detail on the current method of evaluating the status of groundwater resources.

While a standardised method for determining trends has been used for all Groundwater Status Reports, pressure readings taken in the artesian zones of the GAB (J-K) aquifer can vary depending on a number of factors including atmospheric pressure, temperature of water on shut-in, and the length of time that the well has been shut in.

To view descriptions for all status symbols, please visit the *Water Resource Assessments* page on [WaterConnect](#).

To view the *Far North PWA Groundwater Level and Salinity Status Report 2011*, which includes background information on hydrogeology, rainfall and relevant groundwater-dependent ecosystems, please visit [WaterConnect](#).

To view or download groundwater level and salinity data from monitoring wells within the Far North PWA, please visit [Groundwater Data](#) on WaterConnect.

For further information about the Far North PWA, please see the *Water Allocation Plan for the Far North Prescribed Wells Area* on the Natural Resources South Australian Arid Lands [website](#).

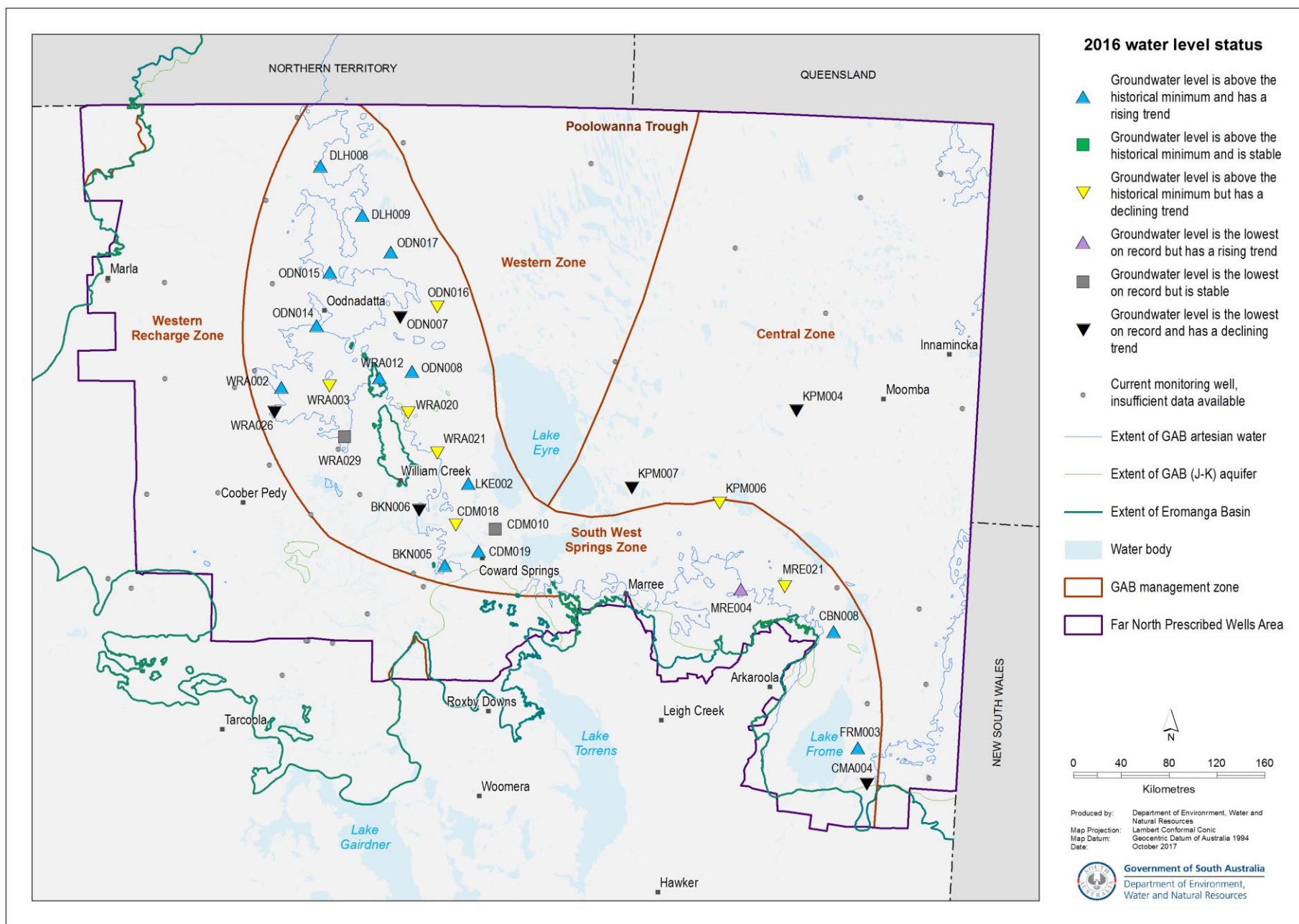


Figure 1. 2016 status of the groundwater pressure levels in the GAB (J-K) aquifer (Far North PWA), based on five-year trends from 2012 to 2016

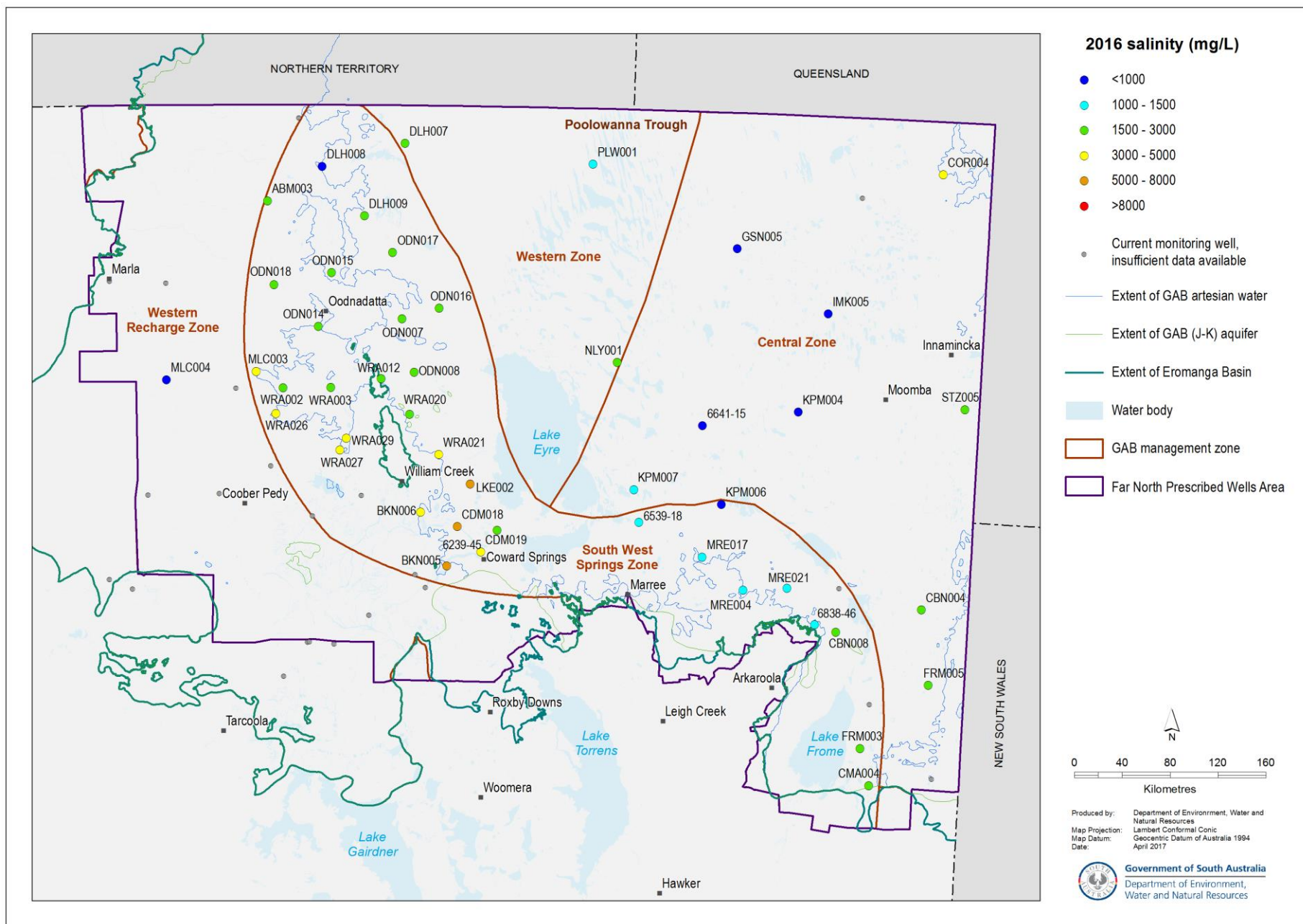


Figure 2. 2016 groundwater salinities in the GAB (J-K) aquifer of the Far North PWA

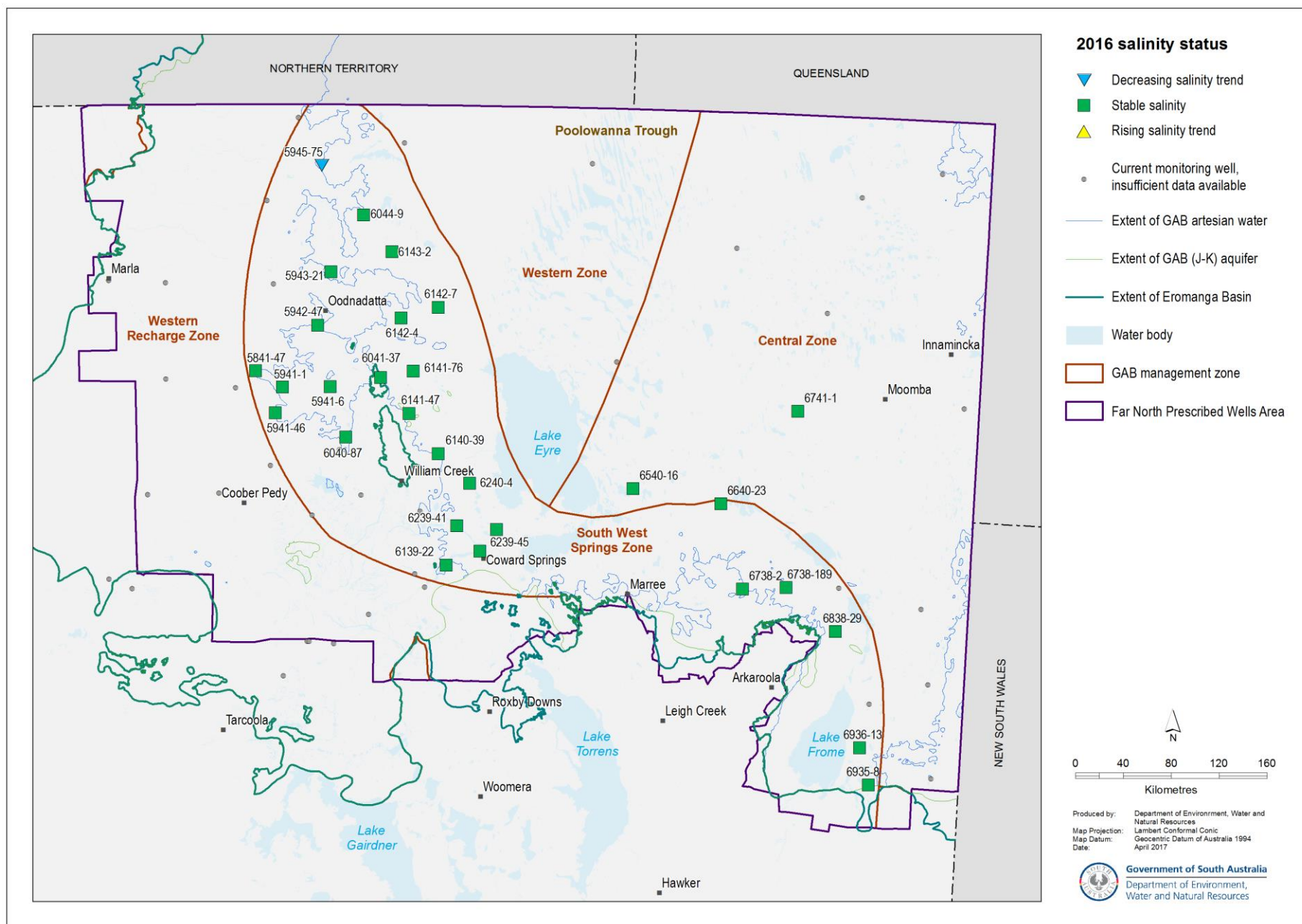


Figure 3. Status of groundwater salinities in the GAB (J-K) aquifer (Far North PWA), based on five-year trends from 2012 to 2016



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